

Hamilton Passive Treatment System
SRI O&M TAG Project # 15 Request #1
OSM PTS ID: PA-30

Requesting Organization: Washington County Conservation District (in-kind partner)
Raccoon Creek Watershed Association (in-kind partner)
Independence Conservancy (in-kind partner)
Receiving Stream: Unnamed Tributary (Raccoon Creek Watershed)
Hydrologic Order: Unnamed Tributary→Potato Garden Run→
Raccoon Creek→Ohio River
Municipality/County: Findlay Township, Allegheny County
Latitude/Longitude: 40°28'26.0004"N / 80°17'43.0008"W
Construction Year: 2003

On 6/11/12, Stream Restoration Incorporated (SRI) was contacted by Gary Stokum of the Washington County Conservation District (WCCD) and the Raccoon Creek Watershed Association (RCWA) regarding problems with the Hamilton Passive Treatment System. The property, on which the system is located, had been sold a few years ago and the new landowner had prevented the WCCD, RCWA, and Independence Conservancy from conducting maintenance. More recently, the property was sold again and the current landowner, Edward "Butch" Novak, contacted the WCCD regarding noticeable problems with the system.

On 7/11/12, Cliff Denholm met with the landowner, Vicky Michaels of the Independence Conservancy, and Gary Stokum at the site. In addition to preventing access to the site for maintenance, the previous landowner "vandalized" the site, which included removing stone from the access road; dumping trash, furniture, and construction materials in and around the treatment system; and trying to back-up the mine drainage utilizing old bricks. Needless to say, the system was in disrepair and overgrown with vegetation.

On 8/14/12, Tim Danehy and Cliff Denholm conducted a site investigation in order to assess the various issues at the site, conduct water monitoring, collect water for cubitainer tests, etc. During this initial site investigation, the existing system was sampled for the first time in about 3 years. Field testing was conducted and water samples were collected. Field tests included pH, alkalinity, ORP and DO.

Additional raw water was collected in order to conduct two cubitainer tests. A cubitainer test, essentially a container filled with limestone aggregate, is used in the design process in order to evaluate the expected alkalinity generation in conditions similar to an Anoxic Limestone Drain (ALD). The container is not disturbed for at least 10-15 hours to mimic standard design parameters for ALDs. At that point, the alkalinity and pH are re-measured. Test results indicated that the alkalinity increased from 240 mg/L to 350 mg/L after 10 hours and from 240 mg/L to about 360 mg/L after 18 hours. Dissolved oxygen measured in the field was 0.20 mg/L. As the pH of the water is greater than 3.5, all dissolved iron is assumed to exist in the ferrous (Fe^{+2}) state. All data indicated that an ALD is suitable for this site and would increase the alkalinity content of the mine discharge. Based on the existing historic water quality data, an ALD alone, however, would probably not be able to produce enough alkalinity to provide net-alkaline water; therefore, the Vertical Flow Pond (VFP) would still likely be needed.

A comparison of the water quality data collected on 8/14/12 (Refer to Table 1.) with historic data (Refer to Table 2.) indicates that the quality of the discharge may be changing over time, as iron and acidity concentrations have significantly decreased. Possibly the most interesting and compelling difference is the final effluent quality. This was one of several known sampling events which documented the existing passive treatment system as producing net-alkaline water. Interestingly, the other documented known instances were in 2008 and 2009 providing further evidence that the water quality has improved and, at times, the existing system is able to treat the water. While the system was performing fairly well on 8/14/12 under low flow conditions, the effluent of the system from the Settling Pond (SP) still contained 18 mg/L of iron. An assumption was made that during high flows the system performance would further decrease. Based on the existing data, BMI, therefore, recommended expanding the treatment system to include an Anoxic Limestone Drain to provide additional alkalinity generation and more settling ponds and wetlands to increase the capacity for the precipitation and settling of metal solids. Expansion of the treatment system was recommended in order to produce good quality alkaline water with circum-neutral pH and low metal concentrations.

Table 1: 8/14/12 Water Quality Characteristics of the Hamilton Treatment System

Sample Point	pH		Alkalinity		Hot Acidity	Iron (T/D)	Aluminum (T/D)	Manganese (T/D)	Sulfate	TSS
	Field	Lab	Field	Lab						
RAW	5.7	5.9	238	156	136	204/198	0.2/<0.04	8/6	699	48
H3	6.3	5.6	118	18	100	146/102	0.1/0.04	8/6	688	113
VFW	6.7	6.2	136	66	-33	68/56	0.1/0.04	10/9	737	99
SP	6.9	6.4	76	55	-39	18/16	0.1/0.04	9/8	753	25

pH in standard units; concentrations in mg/L; both total and dissolved (T/D) metals provided; TSS-Total Suspended Solids

Table 2: Average Water Quality Characteristics of the Hamilton Treatment System

Sample Point	pH		Alkalinity		Hot Acidity	Total Iron	Total Aluminum	Total Manganese	Sulfate	TSS
	Field	Lab	Field	Lab						
RAW	5.7	5.2	238	57	272	393	0.7	6	1540	128
H3	6.4	4.7	99	6	209	303	0.3	6	1350	64
VFW	6.7	5.7	117	31	69	209	0.3	7	1296	43
SP	6.8	3.7	54	5	80	117	0.3	7	1191	16

pH in standard units; concentrations in mg/L; TSS-Total Suspended Solids; data for individual sampling dates available on datashed.org

This initial review indicated that there was a need to expand the treatment system. In addition, the following issues/repairs were identified:

- The existing outlet structures of the VFP and SP need to be replaced.
- The sampling dock at the existing SP needs to be replaced or removed.
- Construction/misc. debris dumped into the VFP and SP needs to be removed.
- Iron sludge on top of the VFP will need to be removed in the future.
- Sections of the split-rail fencing and gates needs repaired/replaced.
- Large brush and trees along the fence line needs to be cleared.
- Existing access road is in need of repair including placement of additional stone.

While a portion of the repairs could be completed under the O&M TAG program, not all of the work could be completed; therefore, a decision was made to seek funding from available grant programs in order to complete the repairs and to concurrently expand the system. A conceptual design and cost estimate was completed by BMI. (Refer to attached.) Applications to the Growing Greener program were submitted in 2012 and 2013 and an ACT 13 grant was also submitted in 2013. None of the grants were funded.

Upon contacting PA DEP, the following reasons were provided as to why the project was not funded:

- Available data did not indicate whether expanding the system would partially or fully restore Potato Garden Run.
- Available data did not present a clear understanding of the current characteristics of the mine pool. Inconsistencies in the sampling data and breaks in time between data have shown possible drastic changes in water quality over time.
- The Reviewer was concerned about the ability to passively treat the discharge.
- The Reviewer felt unsure of the benefit due to lack of stream water quality data.

Pam Milavec of PA DEP recommended that water monitoring be conducted monthly for one year to develop a better understanding of the current water quality and flow rates. Also, additional stream water monitoring would be needed to have a better understanding of the environmental benefits especially in terms of miles of stream restored and to what level of restoration. SRI agreed this was a good approach and then applied to the Foundation for PA Watersheds for funding to conduct water monitoring of the discharge, passive system, and streams. Funding was received in the Fall of 2014 and a monitoring plan was developed. Water monitoring began in November 2014 and is expected to be completed in the Fall of 2015 with a report and recommendations to be completed in time for the 2016 grant rounds.

Shortly after beginning the monitoring program, Range Resources had contacted the WCCD with an opportunity to fix and expand the treatment system utilizing "reclamation-in-lieu of" funds. During the negotiation phase with the landowners to acquire easements, the landowners decided they were no longer willing to provide the additional land area needed to allow for the expansion to occur. Without the expansion, the full use of the funds could not be expended; therefore, Range Resources could not dedicate the funds to the Hamilton site and another site has been chosen and is awaiting approval from the PA DEP. Project partners are currently waiting for the monitoring project to be completed before pursuing further action. Some of the repairs needed may still be addressed by the O&M TAG program under a future request.

The project team thanks the Washington County Conservation District, Allegheny County Conservation District, Raccoon Creek Watershed Association, and the Independence Conservancy for all of their efforts including support and assistance. Funding for technical assistance and maintenance was provided by the PA DEP's Growing Greener and the Foundation for Pennsylvania Watersheds grant programs and in-kind services by project partners.



Construction and miscellaneous debris (*top left & right*) including bricks and furniture were dumped into the VFP and SP and needs to be removed. The existing outlet structures (*middle right*) of the VFP and SP need to be replaced along with the SP sampling dock (*middle left*). Iron sludge (*bottom left*) on top of the VFP will need to be removed. Water monitoring & field tests are being conducted of the system and streams to enable for further evaluation (*bottom right*).